Community Monitoring – a shift to a local focus

NACAA MSC Meeting, November 29, 2021

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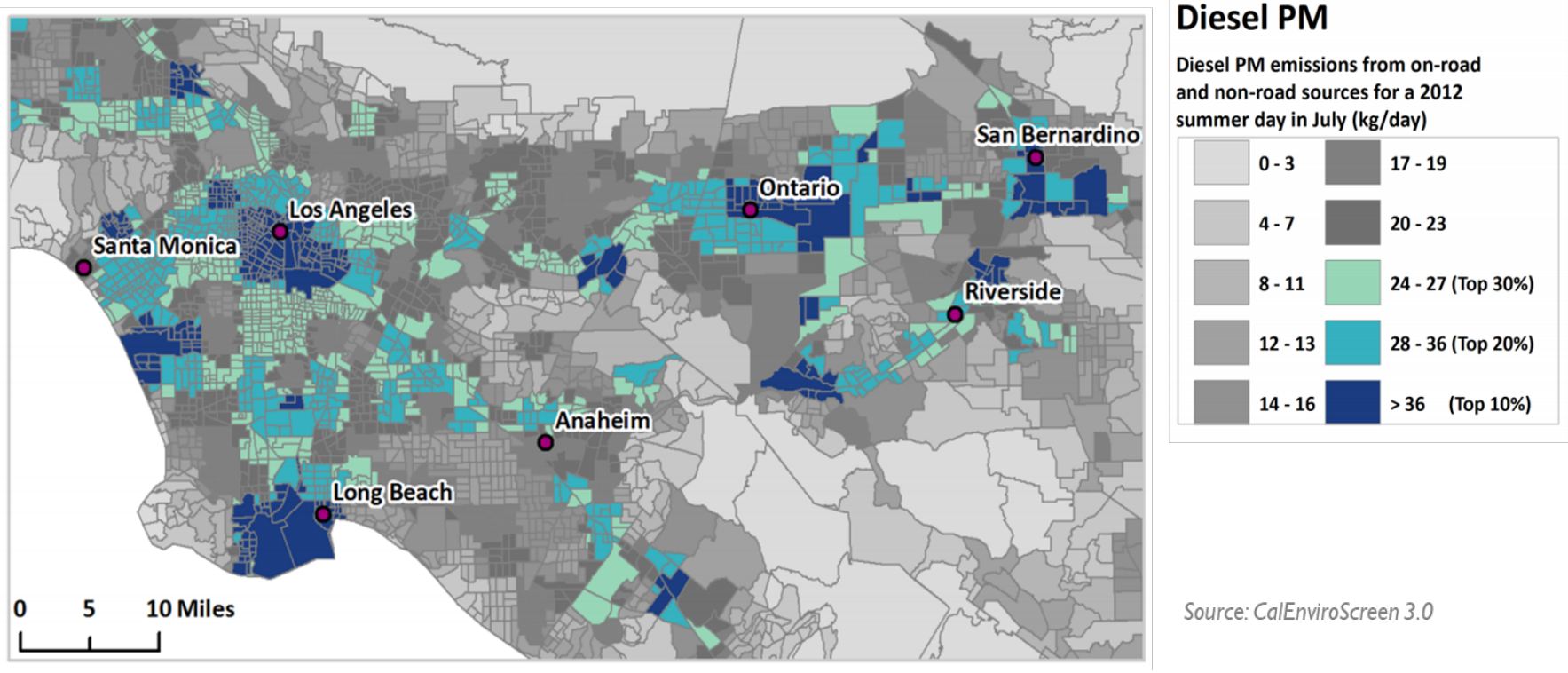
Jason Low, Ph.D. South Coast Air Quality Management District

Motivation for Community-Level Efforts

- Historical focus on regional air quality
- Significant improvement, but disproportionate burdens remain
- Localized issues can still persist
- Need for community-level focus



Source: CalEnviroScreen 3.0

Historical Roots of Health Inequities

Source: CalEPA's Pollution and Prejudice Project

A Community Focus to Bridge Gaps

Regional

Community

Facility

Opportunities and Challenges

Working together to collect information to support action

- Understanding Communities
- Strengthen trust and communication
- Invest Time and Resources
- Building capacity

West Oakland Community Steering Committee maps air quality concerns

Community member narrations giving perspective of ports and refinery air quality issues during bus tour of Long Beach, Carson, and Wilmington areas

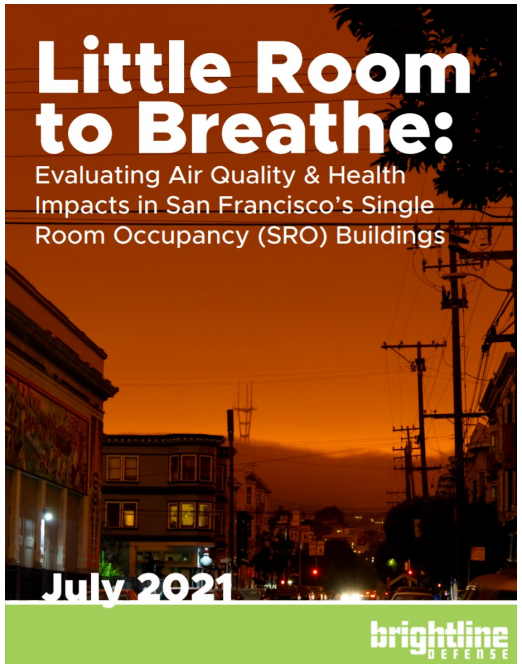
Signposts guiding the paradigm shift

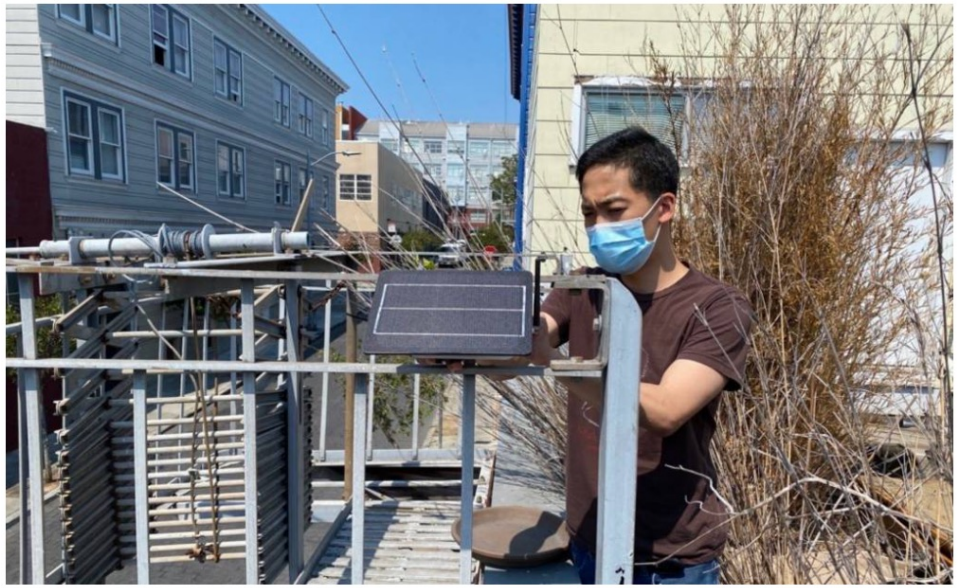
- Take time to **listen** and build relationships and trust
- Design and implement monitoring programs in **partnership** with community members
- **Community-specific** monitoring plans to match the monitoring or assessment tool to the community's need
- **Transparent** sharing of data and findings

A community summit in Richmond, CA (TOP) and East Los Angeles (BOTTOM) learning about the community's priorities for air monitoring

Community Monitoring Programs

- Wildfire smoke response
- AB 617
- STAR Grant



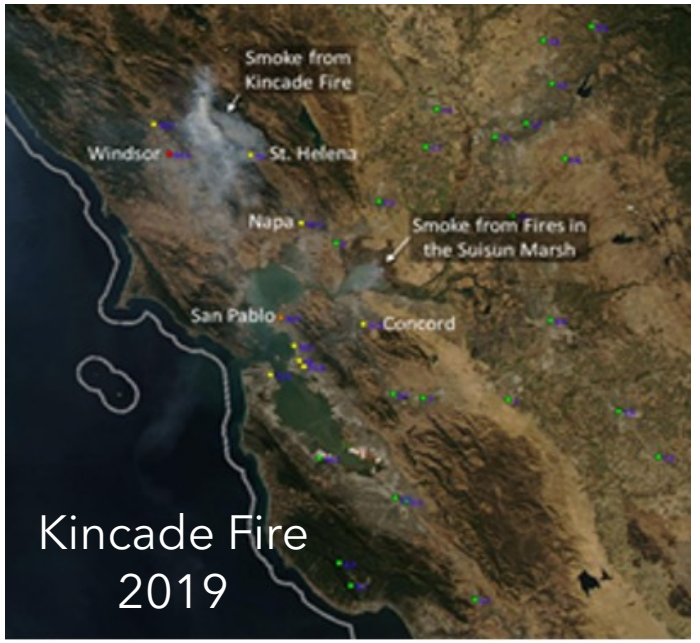


Sensor network and traffic count projects by Brightline Defense

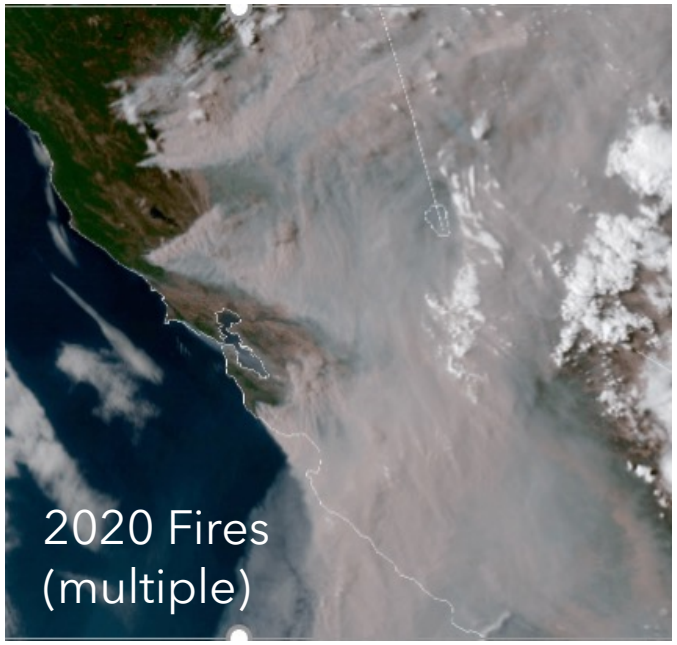
Wildfire Smoke Impacts

Sonoma/Napa Fires 2017


Camp Fire 2018



Kincade Fire 2019


2020 Fires (multiple)

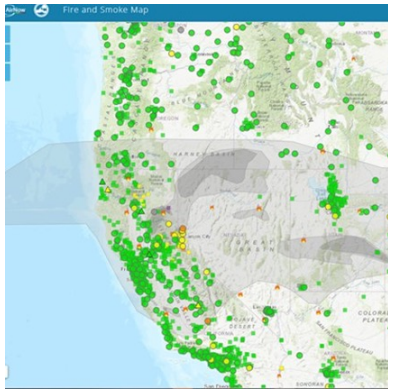
Where can the public get air quality data?

How bad is the air quality near where I am?

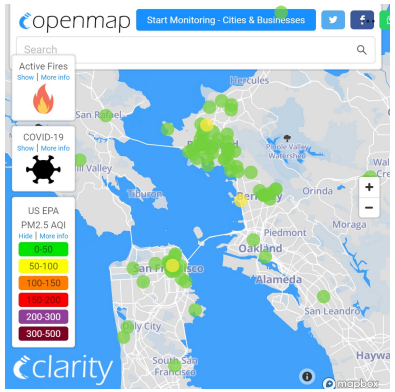
?

Is air quality getting better or worse?

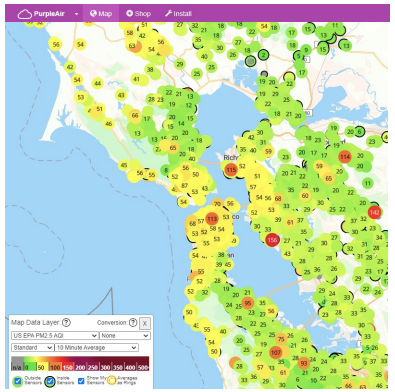
How do air quality levels compare to health-based standards?



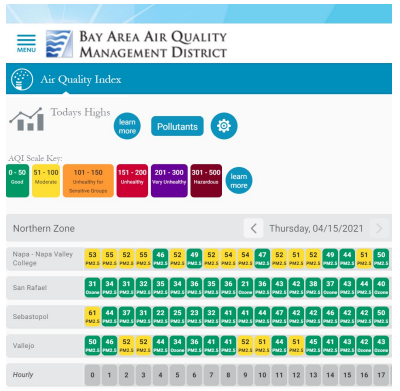
EPA Fire and Smoke Map



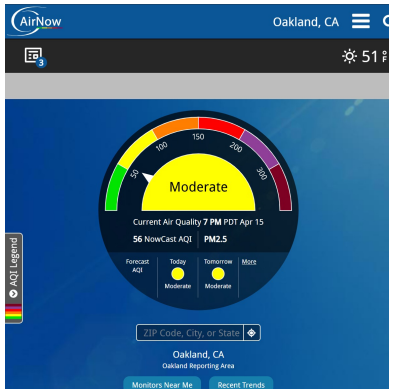
Clarity OpenMap



PurpleAir Map



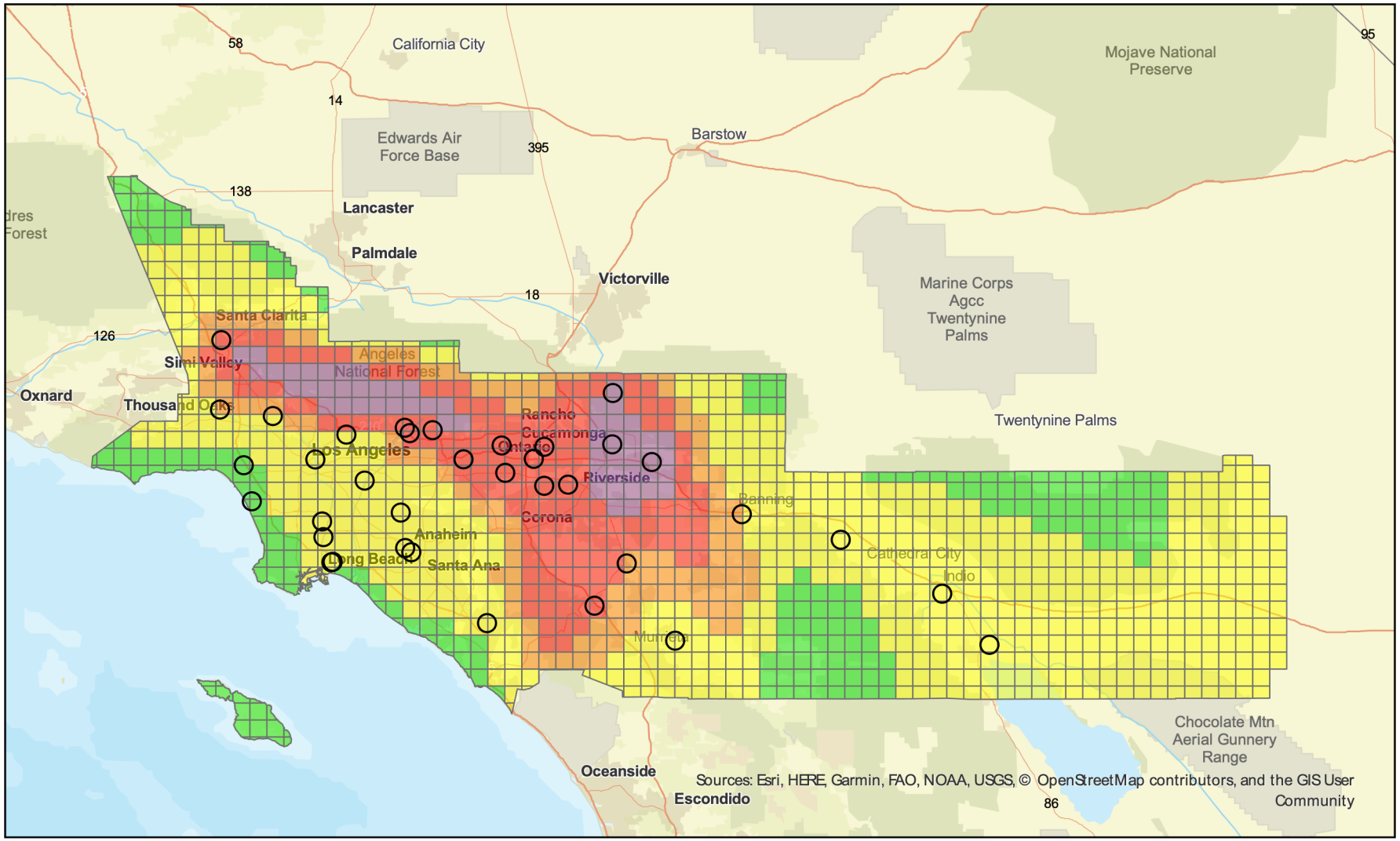
Air District Website



AirNow

Additional details available: https://www.baaqmd.gov/~/media/files/ab617-community-health/richmond/quarterly-report-documents/guide-to-air-quality-data-websites-pdf.pdf?la=en

Real-Time AQI Map (www.aqmd.gov/aqimap)



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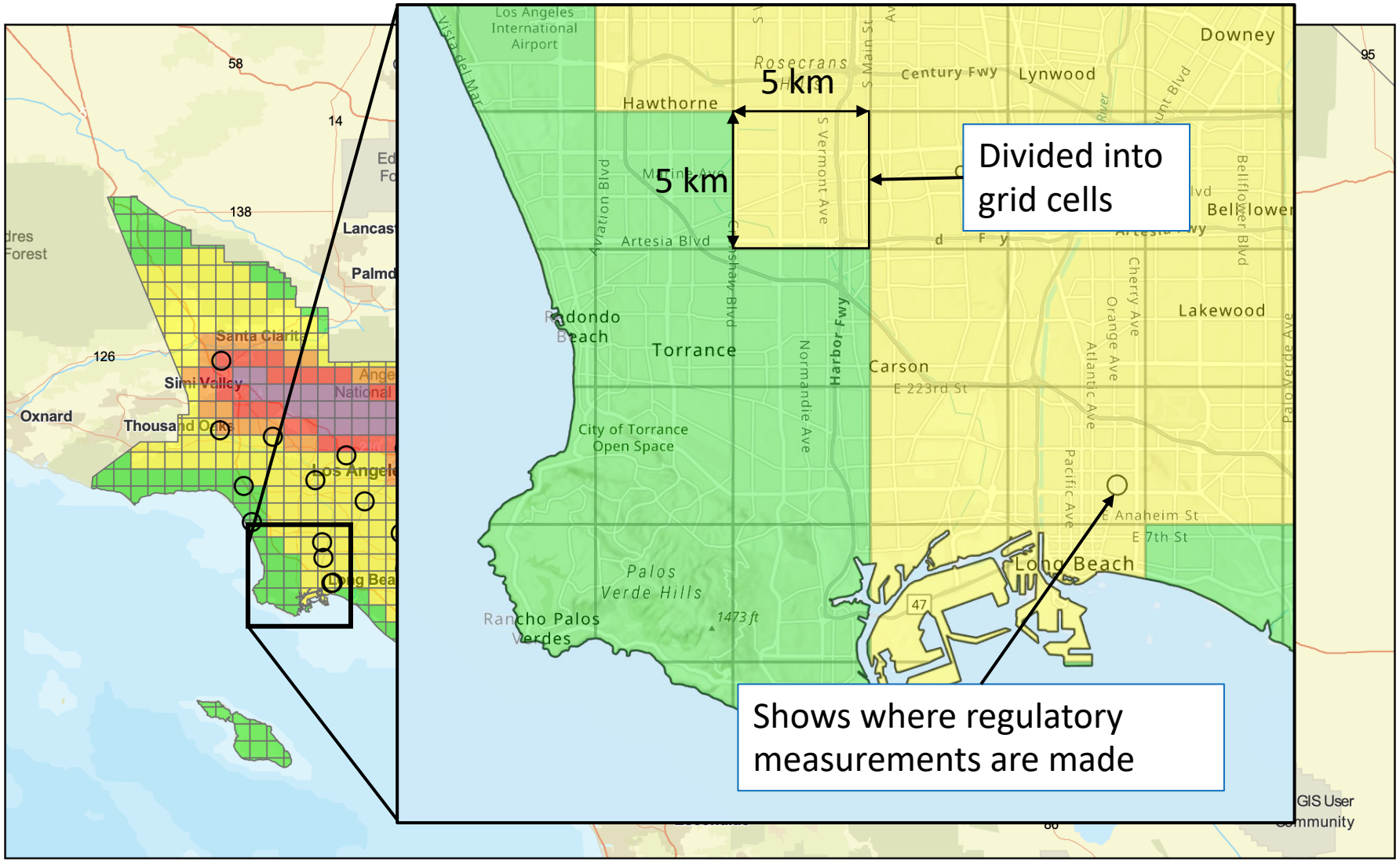
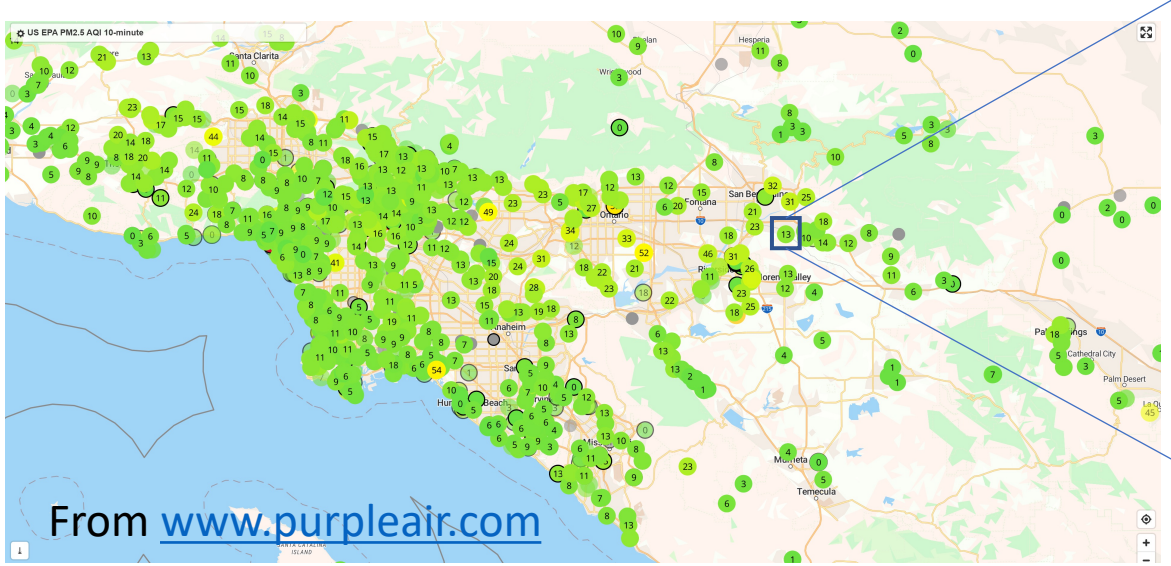


Consumer-Grade Sensors

- About 700 PurpleAir PM2.5 sensors in 2021; Great spatial coverage
- **South Coast AQMD AQI Map** uses sensor data to fill in gaps between monitor measurements



PurpleAir Low-Cost sensor

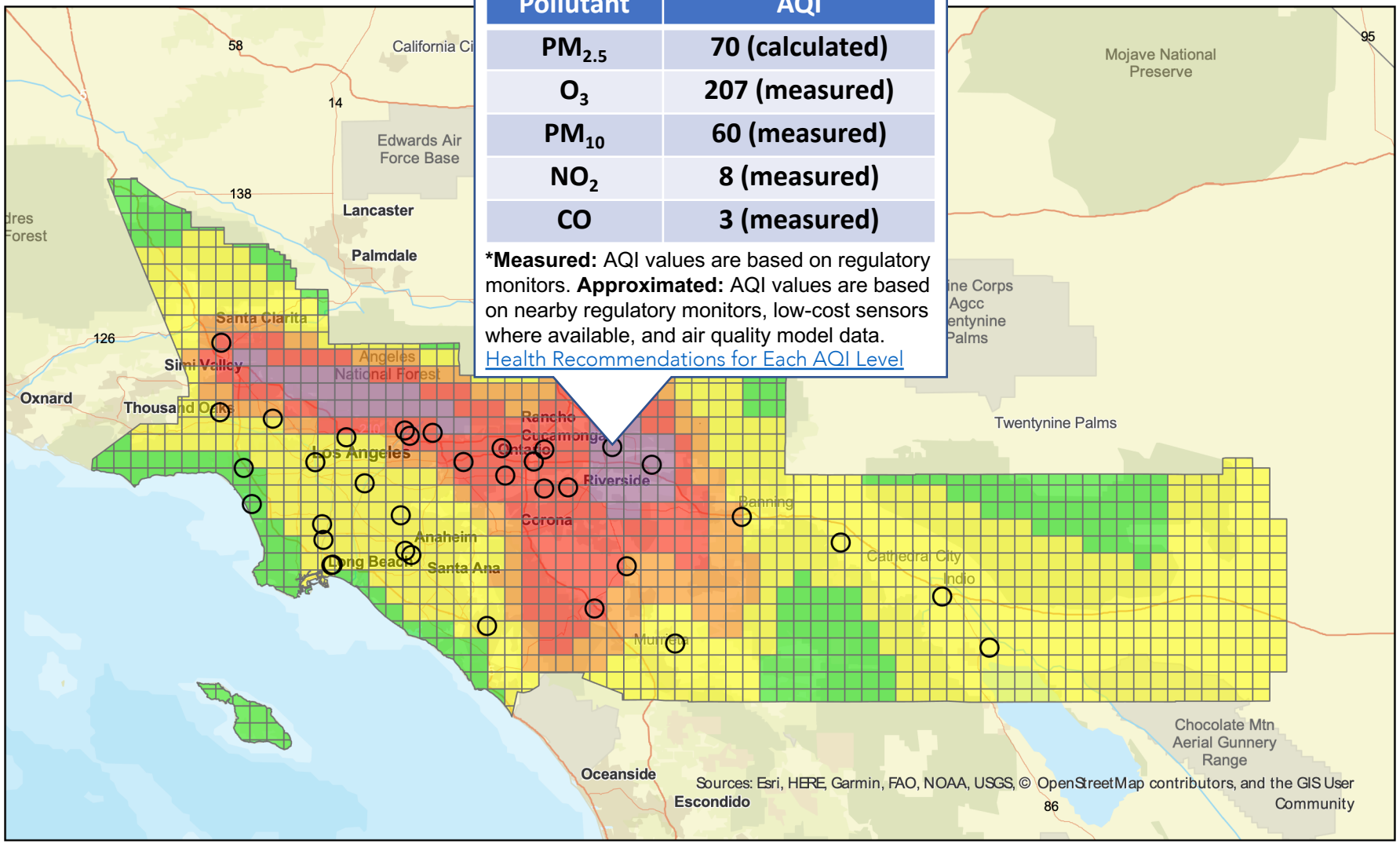
Other types of sensors are also being deployed (aeroqual AQY) and will be integrated after testing
The AQI map also uses model data

Real-Time AQI M d.gov/aqimap)

San Bernardino
AQI: 207
AQI Category: Very Unhealthy
Dominant Pollutant: Ozone | Updated: 4 PM

Pollutant	AQI
$PM_{2.5}$	70 (calculated)
O_3	207 (measured)
PM_{10}	60 (measured)
NO_2	8 (measured)
CO	3 (measured)

***Measured:** AQI values are based on regulatory monitors. **Approximated:** AQI values are based on nearby regulatory monitors, low-cost sensors where available, and air quality model data.
Health Recommendations for Each AQI Level

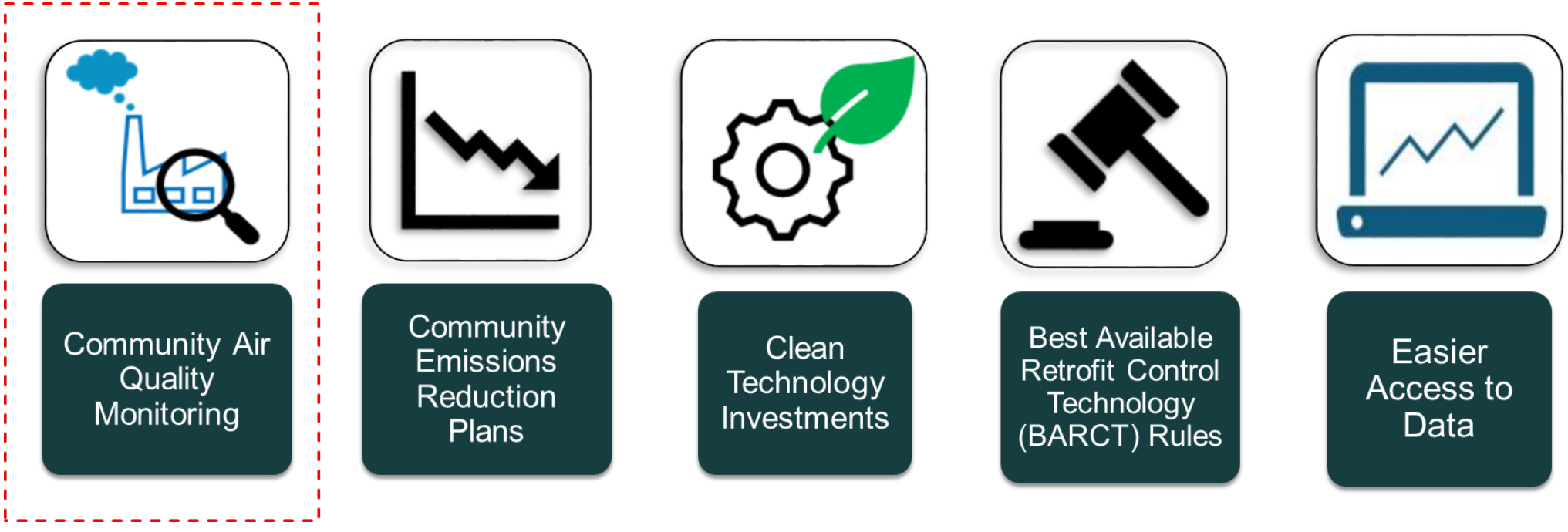


ASSEMBLY BILL (AB) 617

- Responds to history of environmental injustice in low-income, communities of color.
- Partner with community to address higher levels of air pollution in historically disadvantaged communities.
- Address exposure to harmful air pollutants in impacted communities.

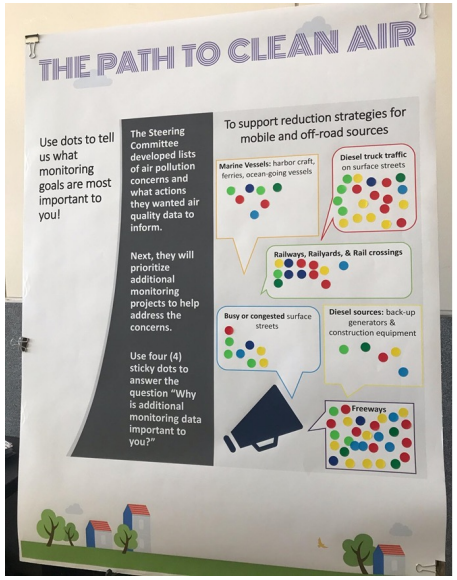
ASSEMBLY BILL (AB) 617

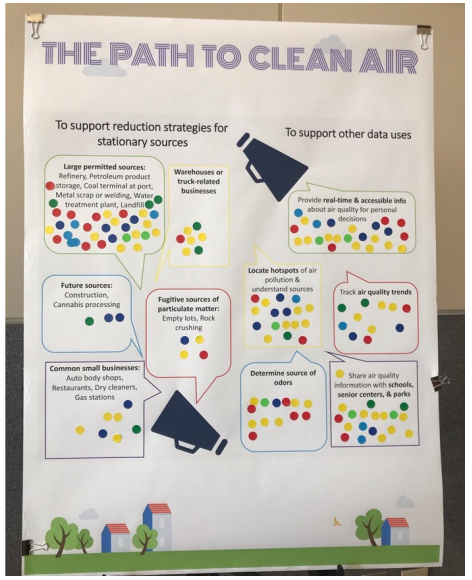
- Statewide program enacted in 2017 to **reduce air pollution** in communities that are disproportionately impacted by air pollution
- Community partnerships and leadership are central to the program



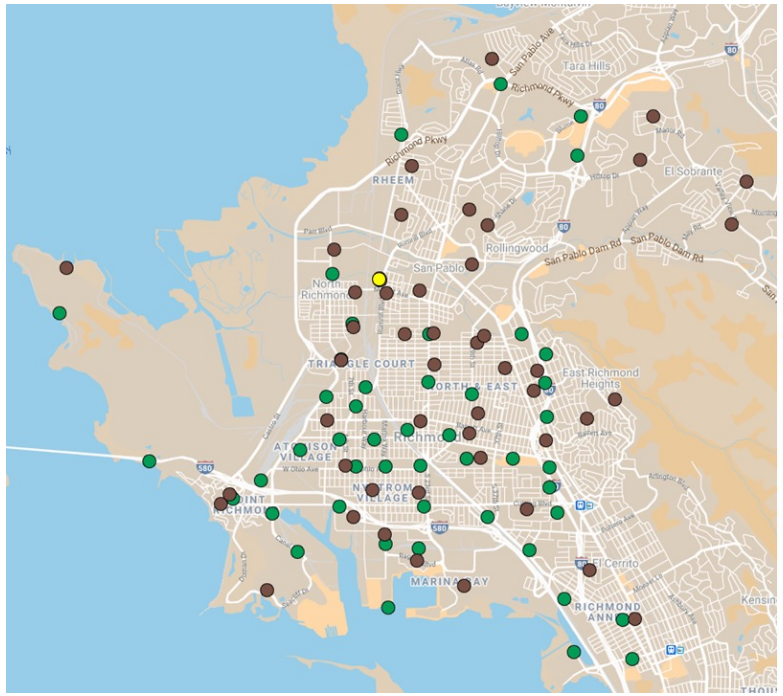
Richmond-North Richmond-San Pablo Monitoring Community Steering Committee

- Designed the process
- Engaged the community
- Compiled lists of air quality concerns or places of interest





Plan monitoring projects to collect data for action

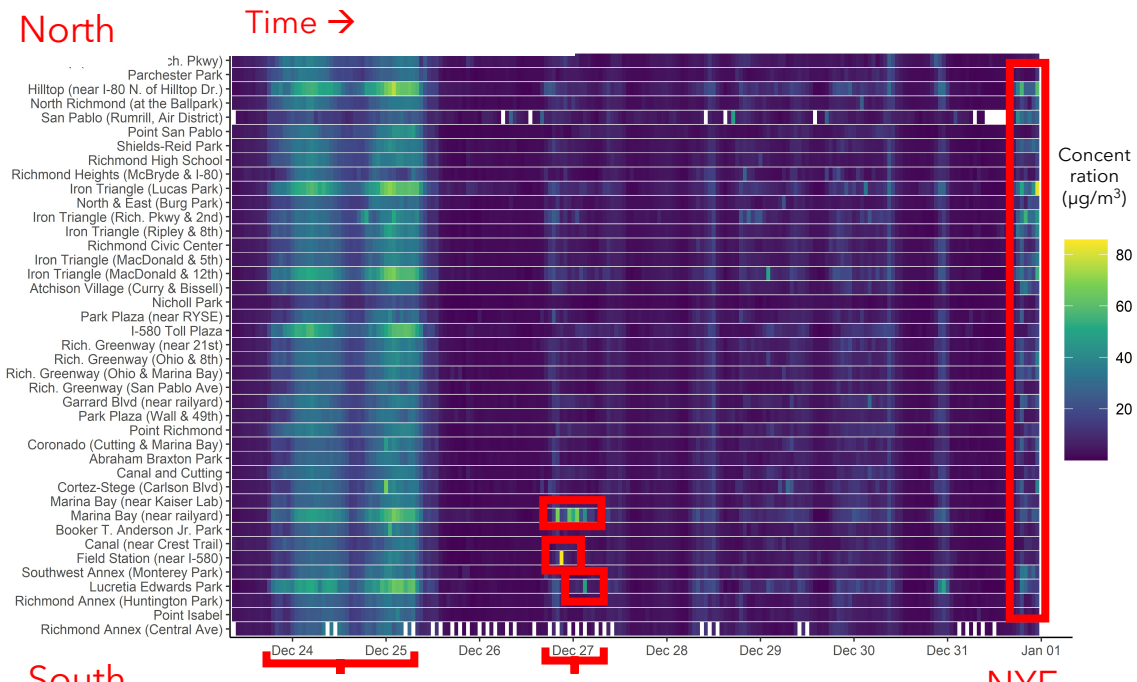


AB 617 Richmond-San Pablo Community Air Monitoring Plan

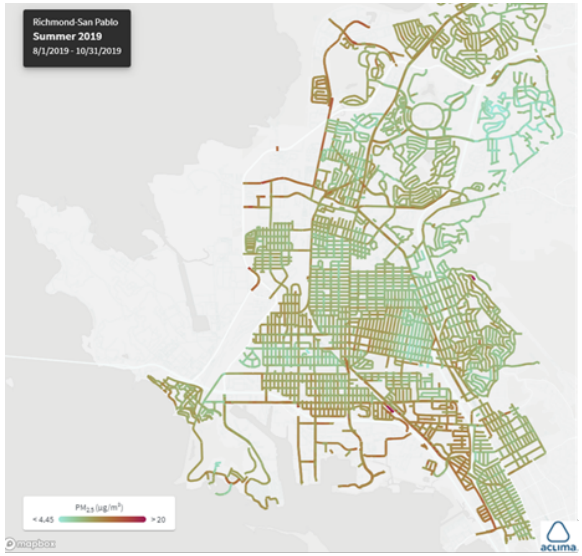
DRAFT – NOVEMBER 2019

Analyzing data and preparing reports

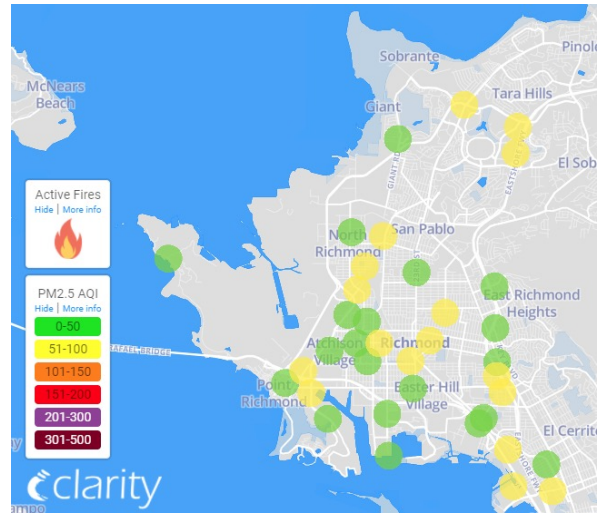
Hourly $PM_{2.5}$ concentrations within the community



Estimated typical PM levels on all streets



Real-time PM data in more locations



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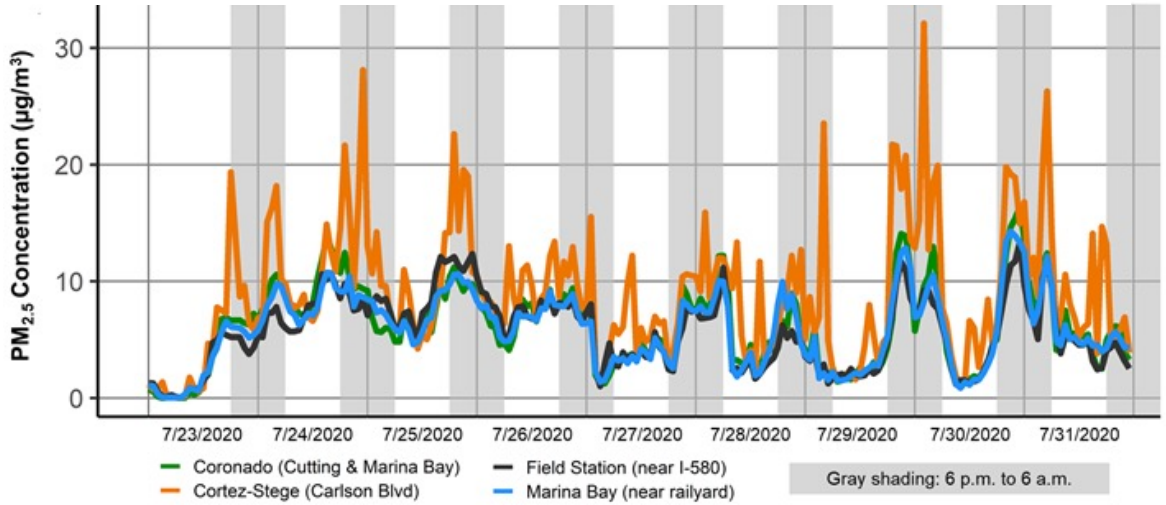

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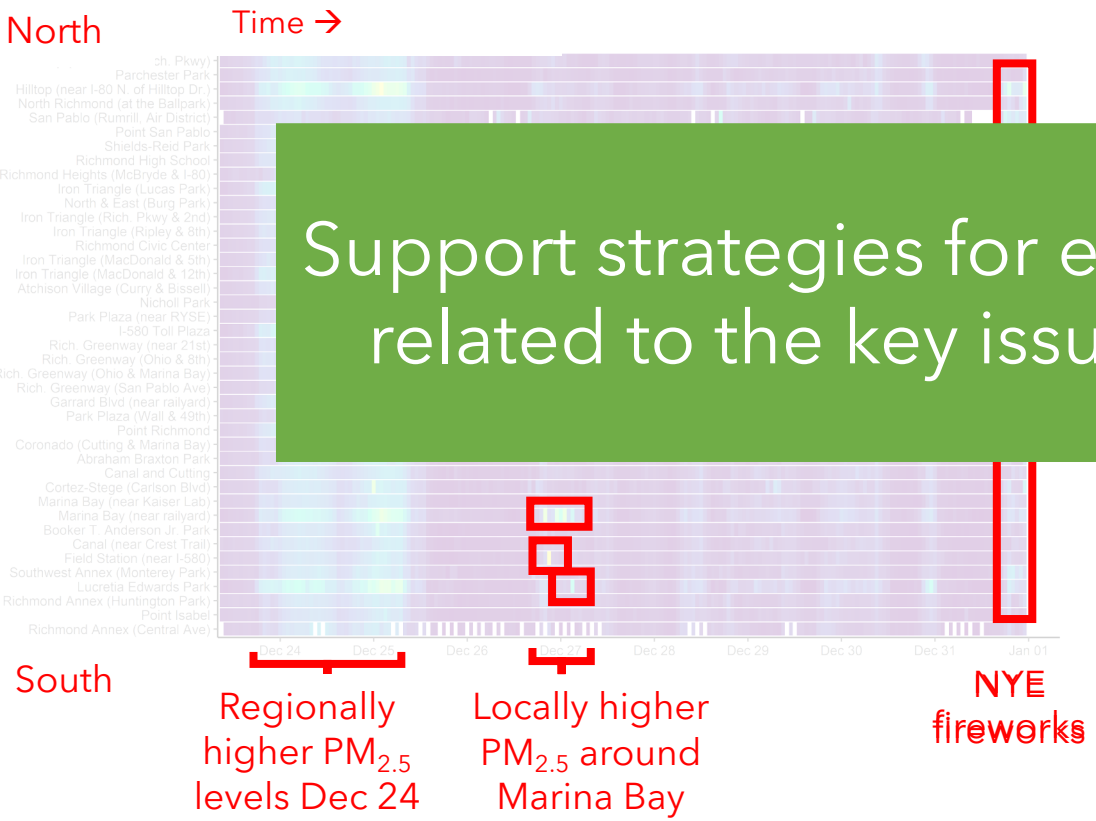
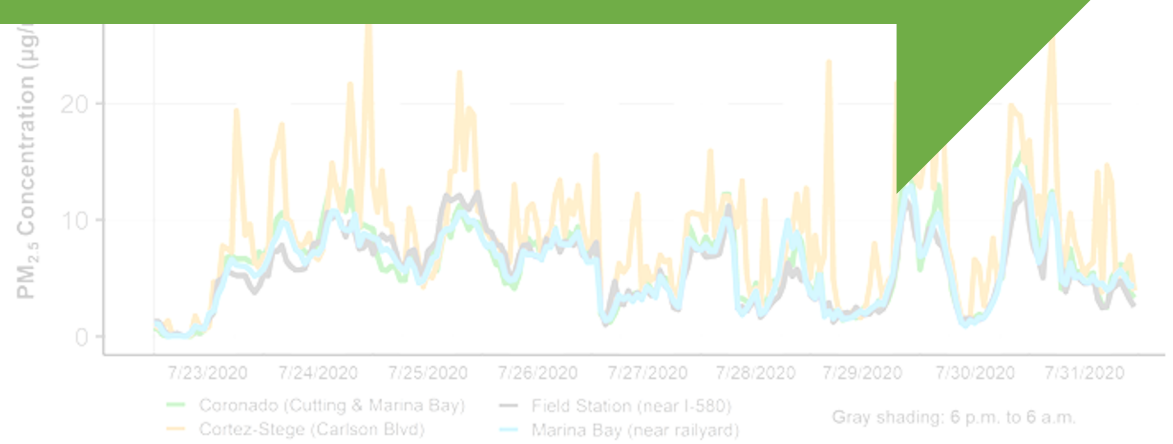


Support strategies for emission and exposure reductions related to the key issues identified by the community



Air Quality Concerns and Priorities

Diesel Exhaust

Truck Traffic

Railyards

Sensitive Receptors

Air Toxics

Refineries

Metal Processing Facilities

Oil Wells

Auto Body Shops

Odorous Compounds

Rendering Facilities

Waste Transfer Stations

Criteria Pollutants

Cement Batch Plants

Dust

…and more!

General Air Monitoring Approach

Mobile Monitoring

- Survey large areas
- Identify hotspots and unknown sources
- Support inspections and enforcement actions
- Inform emission reduction efforts

Fixed Monitoring

- Provide more information about possible sources
- Assess levels in community
- Support emission reduction strategies
- Track progress

Sensors

- Provide more information about how levels vary within the community
- Complement other monitoring strategies
- Engage the community in air pollution measurement

Comprehensive and Purposeful Air Monitoring

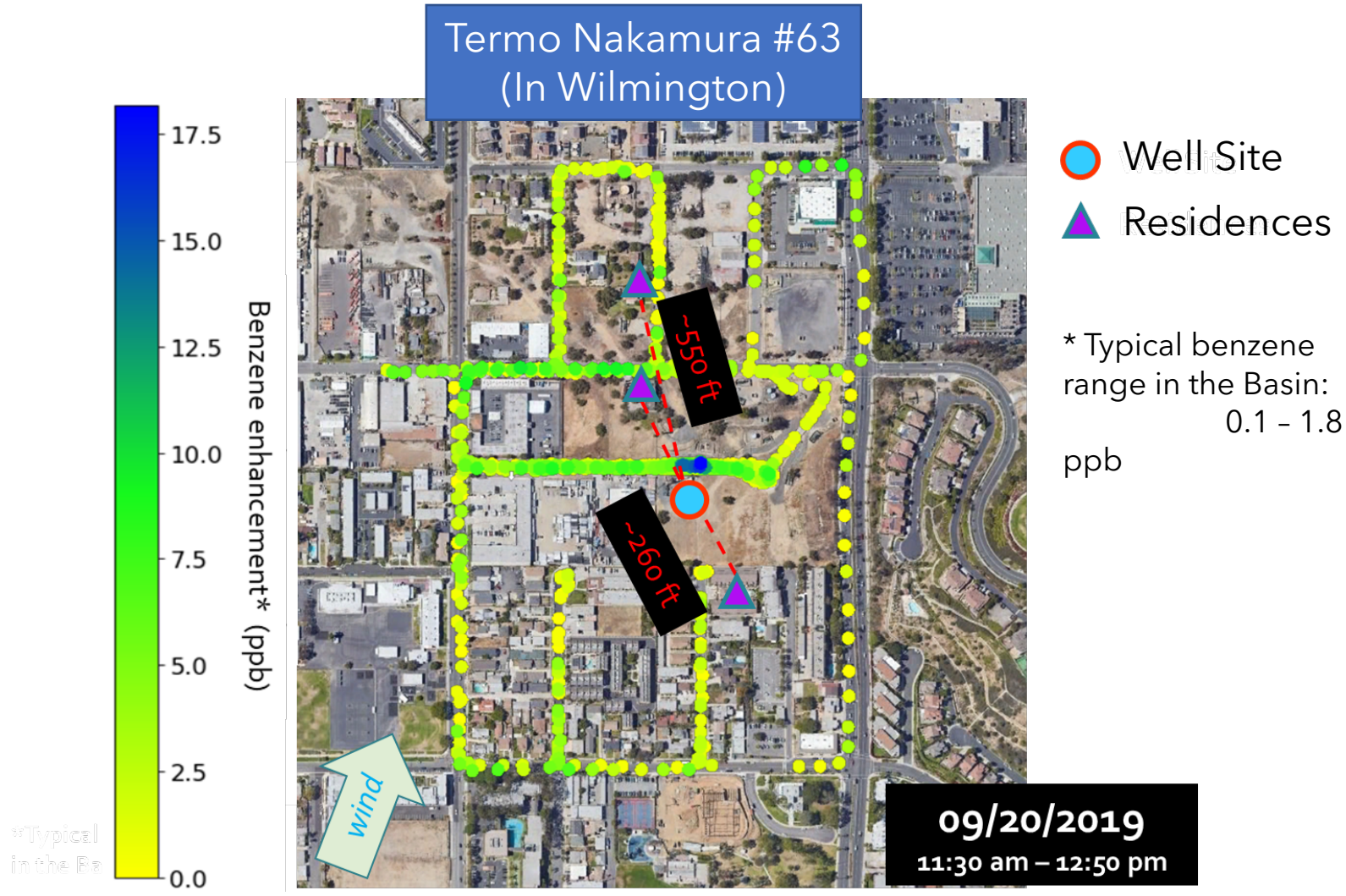
Oil Wells

Wilmington, Carson, West Long Beach Community

- Target Air Pollutants
  - Methane, VOCs, Alkanes
- Purpose of Air Monitoring
  - Identify Leaks and High Emitting Oil Wells
  - Support Enforcement Actions
  - Assess Community Impact
- Air Monitoring Solution
  - Optical Remote Sensing Van
  - Optical Gas Imaging Camera
  - Partner with Community (CFASE) that Uses Hand Held devices

Oil Wells

Wilmington, Carson, West Long Beach Community



Well Site

Residences

* Typical benzene range in the Basin: 0.1 – 1.8 ppb

Oil Wells

Wilmington, Carson, West Long Beach Community

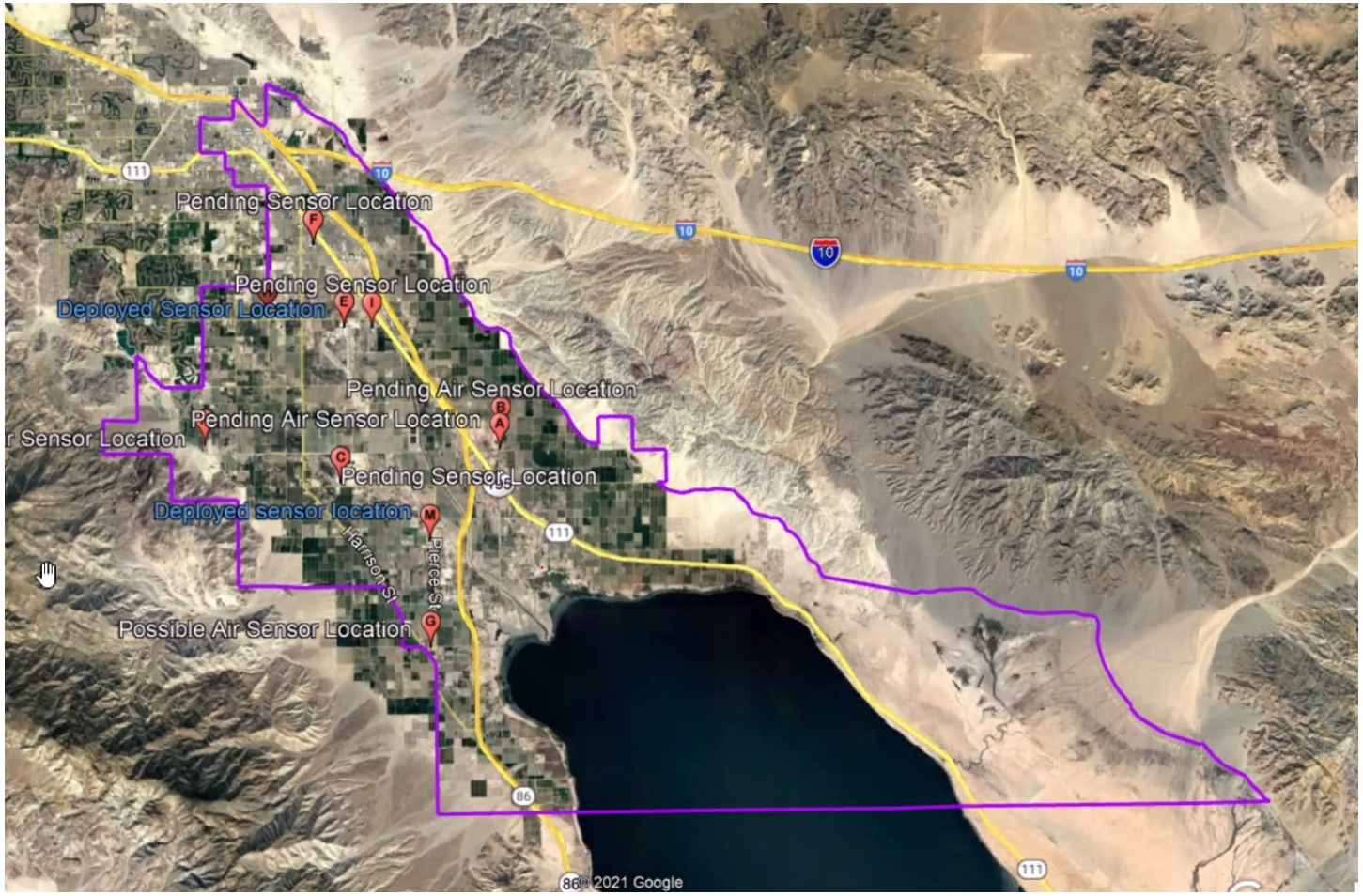
09/19/2019

11:32 am

Eastern Coachella Valley: Community Sensor Network

A. Paseo De Los Heros #1
B. Paseo De Los Heros #2
C. School Complex – 3 Schools*
D. North Shore Park*
E. Airport
F. Bobby Duke School*
G. Borrego Health Facility*
H. Coachella Valley High School*
I. Coachella Valley Unified School District HQ*
K. Key Key Tum Park*
M. Mission San Jose Church

- AQY sensor already deployed
- Potential locations for deployment (pending approval)
*Assistance needed



U.S. EPA Science To Achieve Results (STAR) Grant

"Engage, Educate, and Empower California Communities on the Use and Applications of Low-Cost Air Monitoring Sensors"

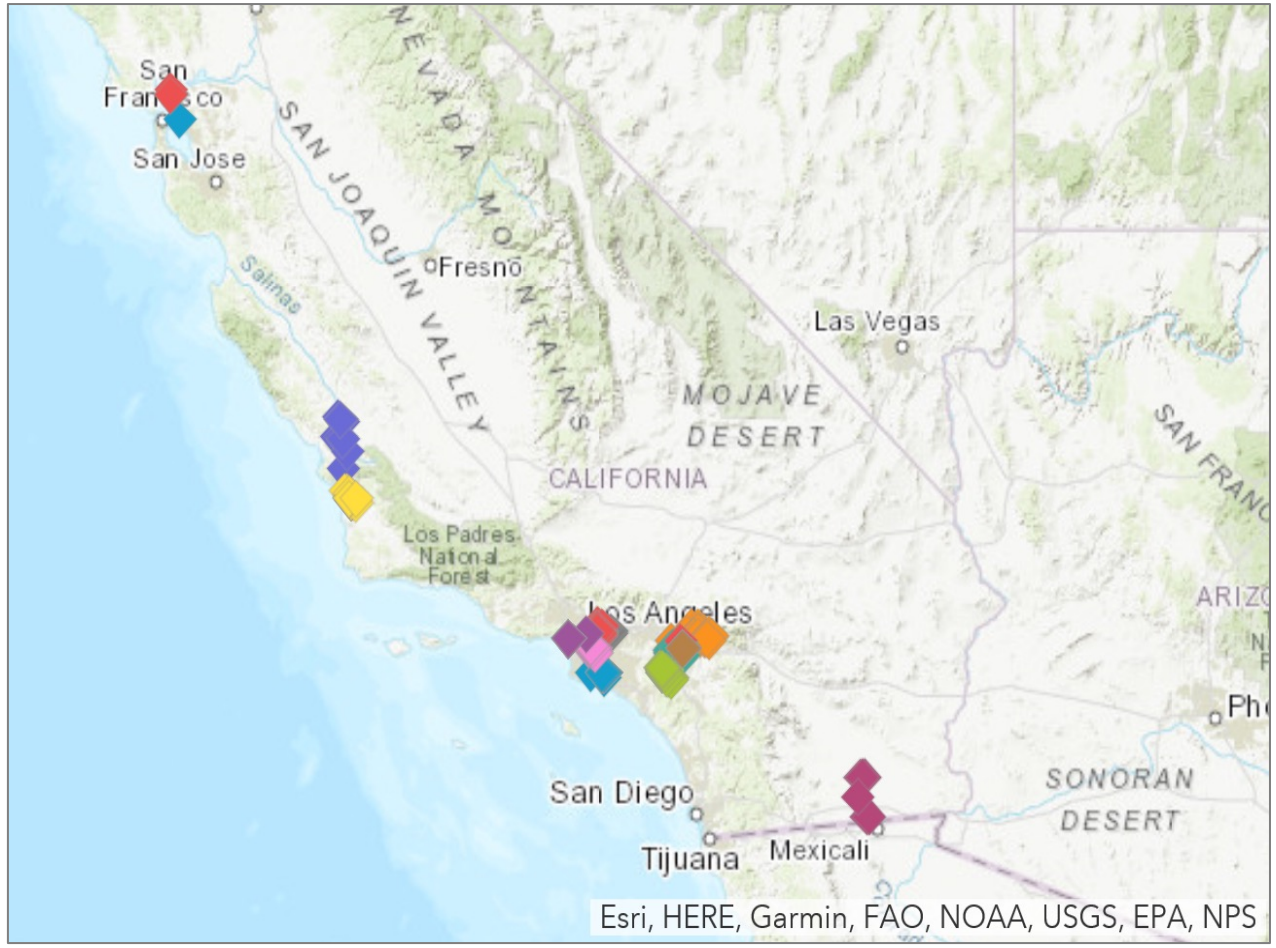
- *Main Objective:* Provide communities across California with the knowledge necessary to appropriately select, use, and maintain "low-cost" sensors and to correctly interpret the collected data
- In 2015 the South Coast AQMD was awarded funding from the U.S. EPA under their "Science to Achieve Results" (STAR) Program ("Air Pollution Monitoring for Communities")
- Collaboration:

South Coast AQMD

STi | Sonoma Technology

UCLA

STAR Project Outcomes

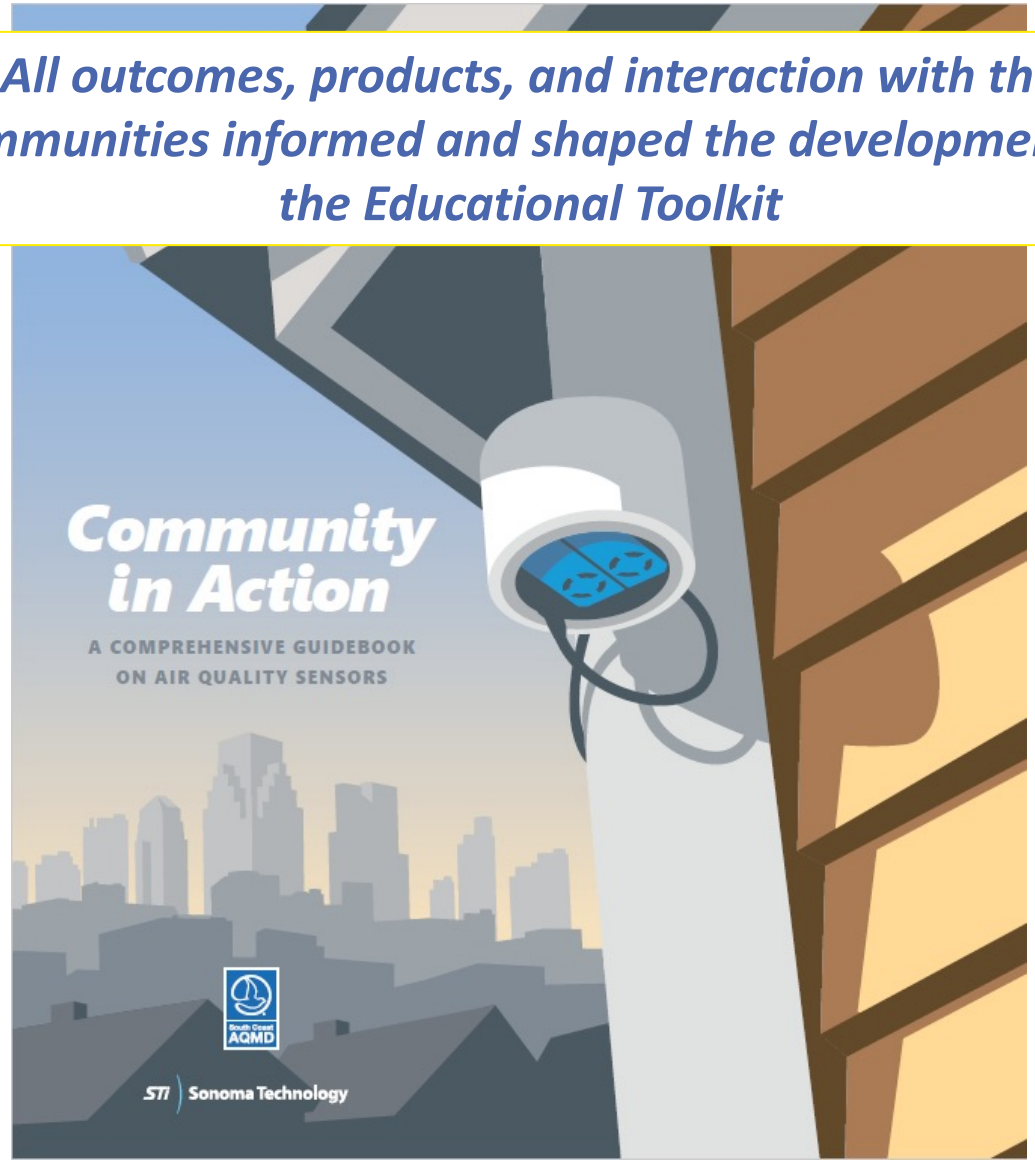


- **14** California communities
- **300** PurpleAir PA-II sensors
- **100** Aeroqual AQY sensors
- **3** years of data
- **33** community workshops
- **86** installation surveys
- **113** surveys collected
- **3** Reports for/by STAR Grant communities
- **7** peer-reviewed publications
- **1** Master's Thesis
- **2** Conference Training Workshops
- **16** Conference Presentations

STAR Project: Educational Toolkit

All outcomes, products, and interaction with the communities informed and shaped the development of the Educational Toolkit

- Guidebook on Air Quality Sensors
- Training videos (3)
- Installation guides
- Surveys and project forms
- Data analysis/visualization tools
- Infographic examples
- Community reports & analysis



- ✓ Accessible to public
- ✓ Visually engaging
- ✓ One or more languages
- ✓ Decision-making to reduce exposure
- ✓ Data collection practices
- ✓ Resources for additional info

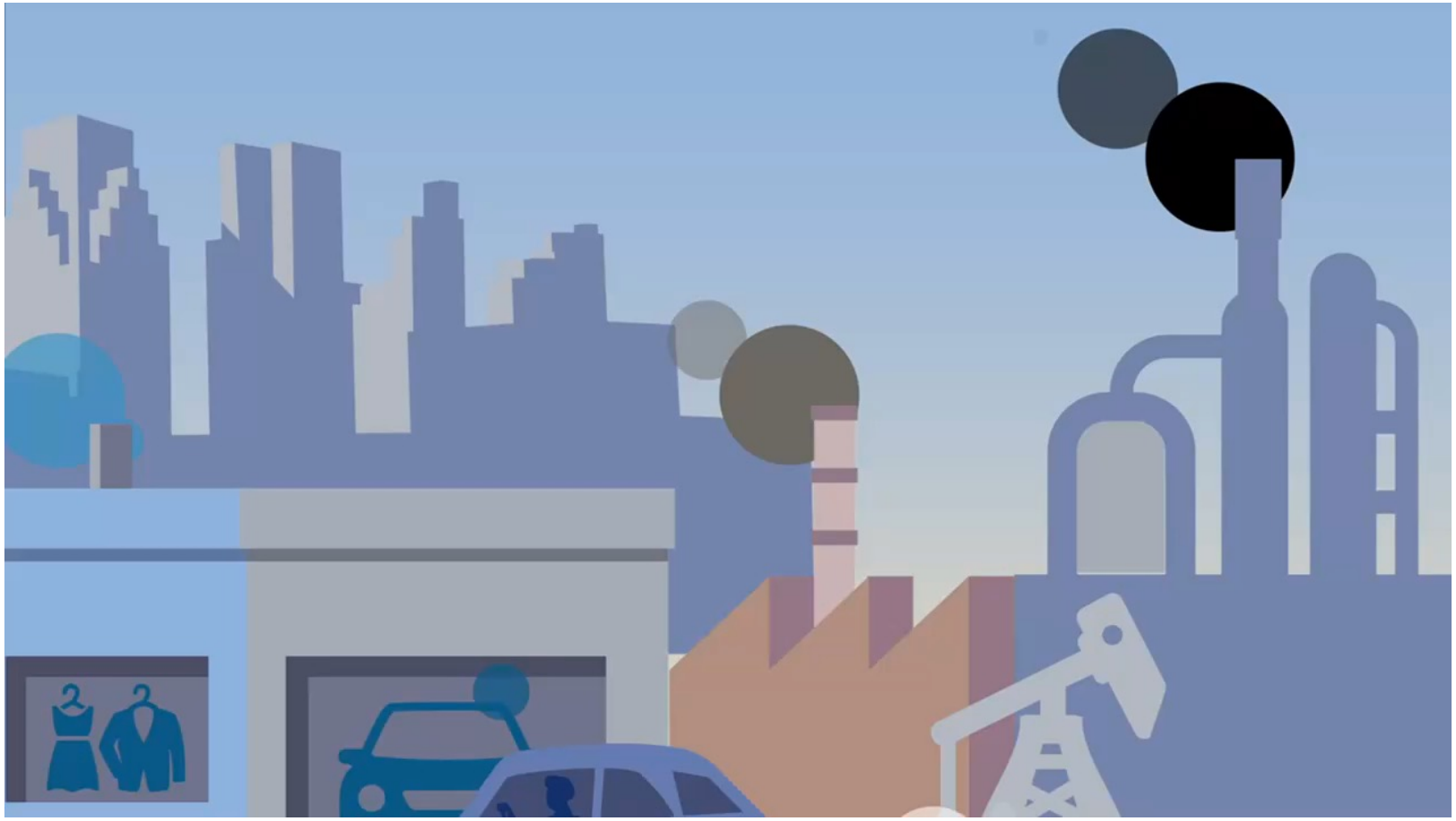
Educational Toolkit Versatility

- Guidebook and other resources are designed to meet the needs of a broad range of users and projects
- For example, users could include:
  - An academic researcher new to community-based work
  - A community leader new to air quality and concerned about local sources
  - Staff from a government agency experienced in working with the public, but new to sensors
  - An individual interested in using sensors to better understand their own air quality

Table 1-1. A roadmap of the guidebook for users with different responsibilities and interests.

	Organizer Community organizer or project lead for an air quality sensor project	Participant Participant using a sensor in a community led project	Individual Individual member of the public using a sensor	Partner Academic, Industry Government Agency New to using sensors	 New to air quality monitoring	 New to community-based research
Chapters						
2 Learn Valuable information about air quality	●	●	●		●	
3 Plan Plan a successful project	●		●	●	●	●
4 Deploy Deploy and maintain your sensors	●	●	●	●	●	●
5 Act Move from results to action	●	●	●	●	●	●
Appendices						
A Air Quality Index	●	●	●		●	
B FAQs	●		●	●	●	●
C Purple Air Sensor	●	●	●	●	●	
D Data Analysis	●		●	●	●	
E Infographic	●					●
F Install Template				●		
G Project Template	●					●
H Log Notes	●	●	●		●	
I Liability Form	●			●	●	●
J Agency Contacts	●					●
K Sensor Tests	●			●		
L DataViewer	●	●		●	●	●
M Community Reports	●	●		●		●

Educational Toolkit Guidebook

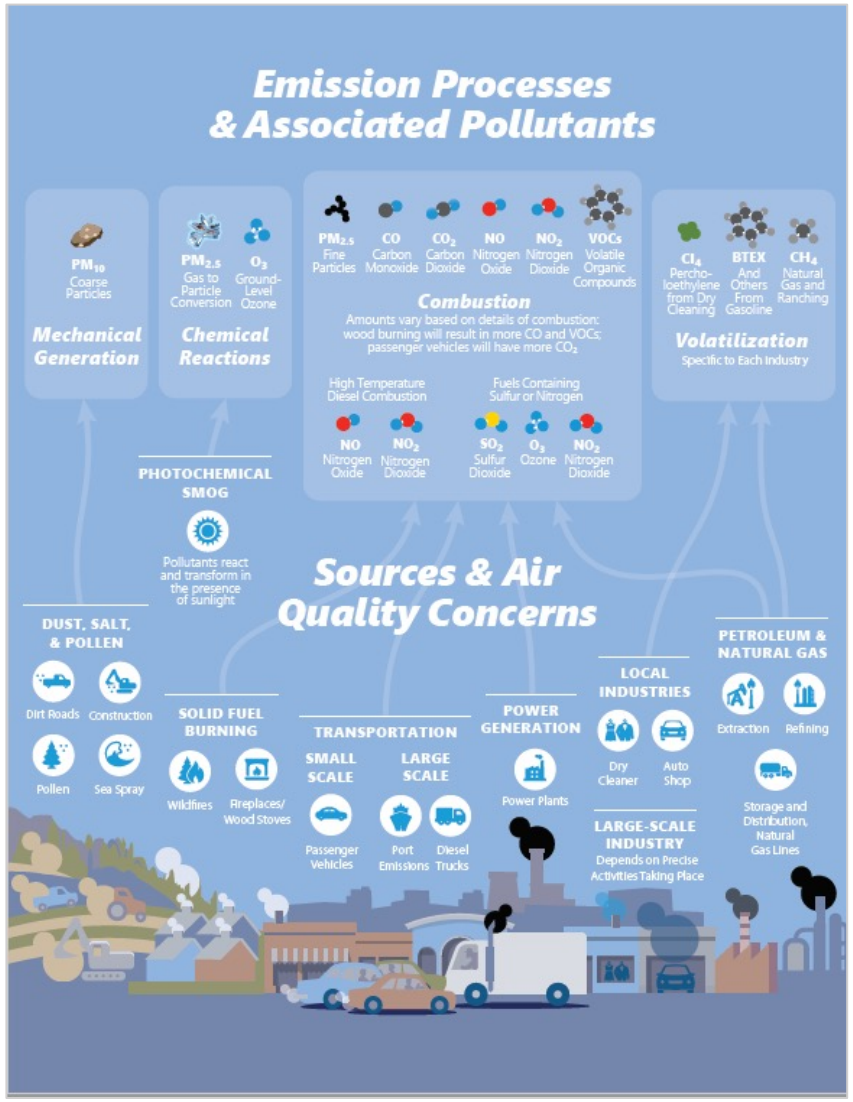


http://www.aqmd.gov/aq-spec/special-projects/star-grant

Educational Toolkit: Understanding Air Quality and Monitoring

Table 2-2. Summary of characteristics of fine and coarse particulate matter (adapted from Seinfeld and Pandis, 1998).[11]

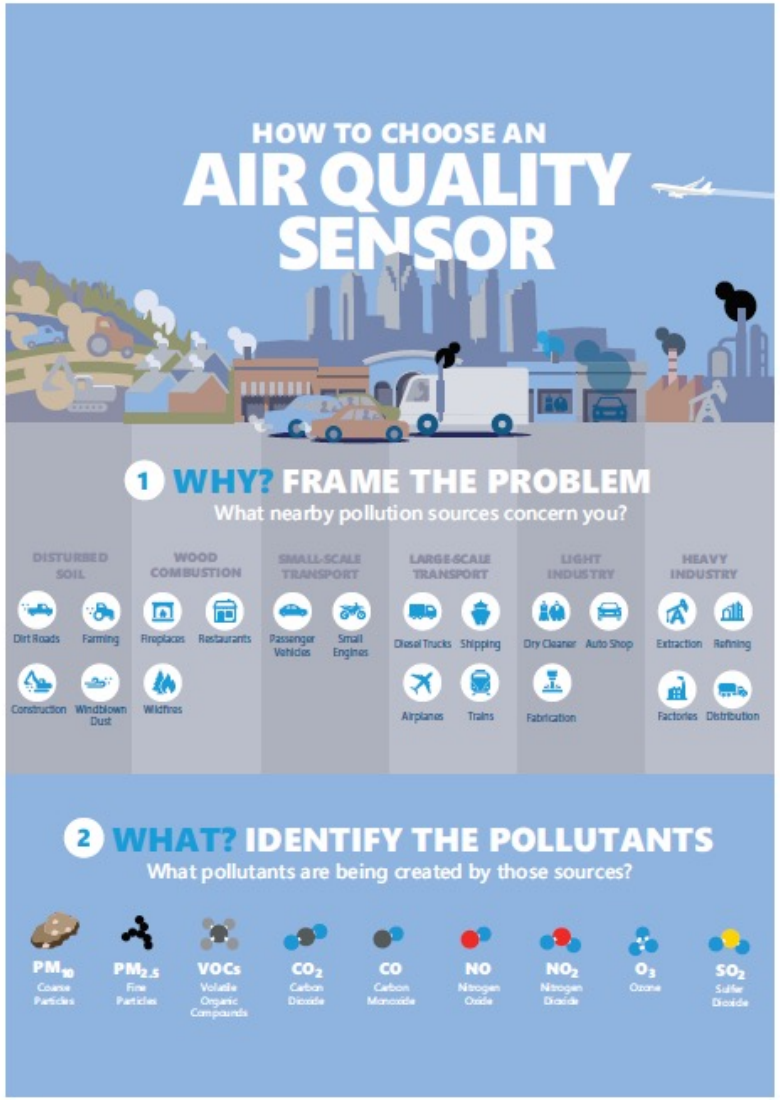
	$PM_{2.5}$ Fine Particles	PM_{10} Coarse Particles
Chemical Process *How the particles are formed*	Reaction, nucleation, condensation, coagulation, cloud/fog processing	Suspension of dust or sea salt, mechanical process
Sources *Where the particles come from*	Coal Combustion, Gasoline Combustion, Diesel Combustion, Wood Combustion, Motor Vehicles, Industry, Fires, Gas to Particle Conversion	Industrial Dust, Farming Dust, Mining Dust, Unpaved Roads, Biological Sources, Construction/ Demolition, Ocean Spray, Road Salt
Composition *What the particles are made of*	Sulfates and Nitrates, Elemental Carbon, Other Organics, Water, Metals	Crustal Elements, Salt, Pollen, Mold, Plant and Animal Debris
Formation *When the particles are formed*	Primary (directly emitted) and Secondary (formed in the atmosphere)	Primary (directly emitted)
Atmospheric Lifetime *How long the particles stay in the air*	Days to Weeks	Minutes to Days
Travel Distance *How far the particles travel*	100 to 1000+ km (about 60 to over 600 miles)	Generally < 100 km (< about 60 miles)

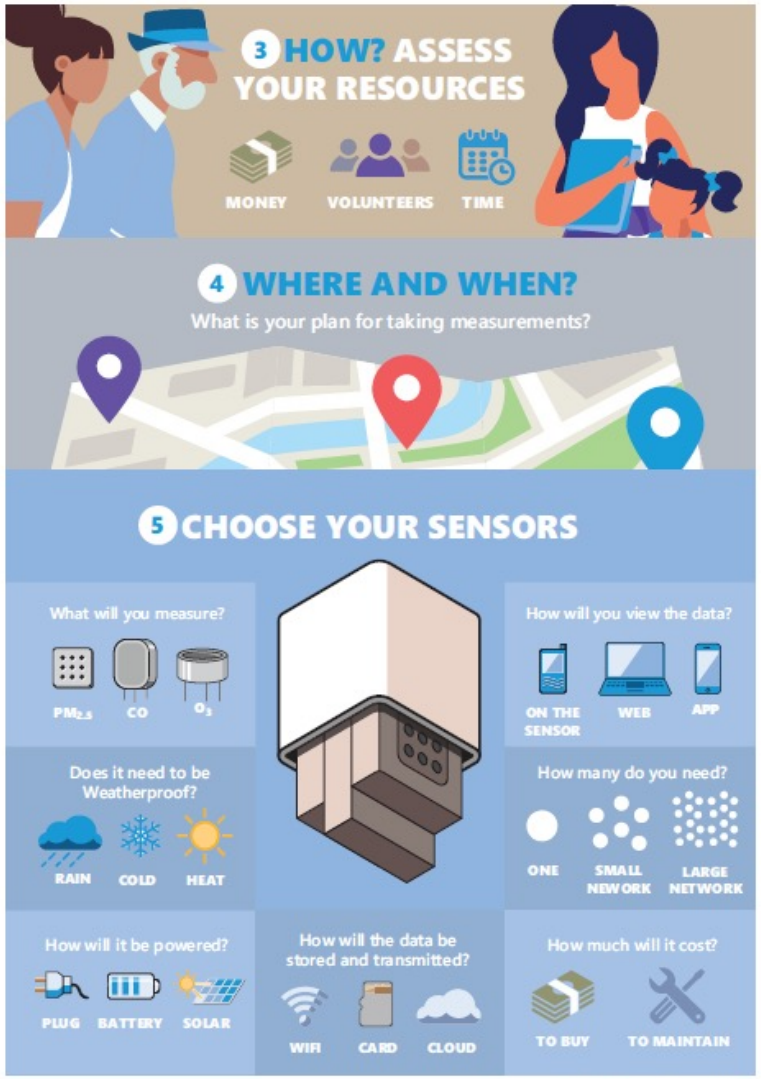


Educational Toolkit: Planning Guidance

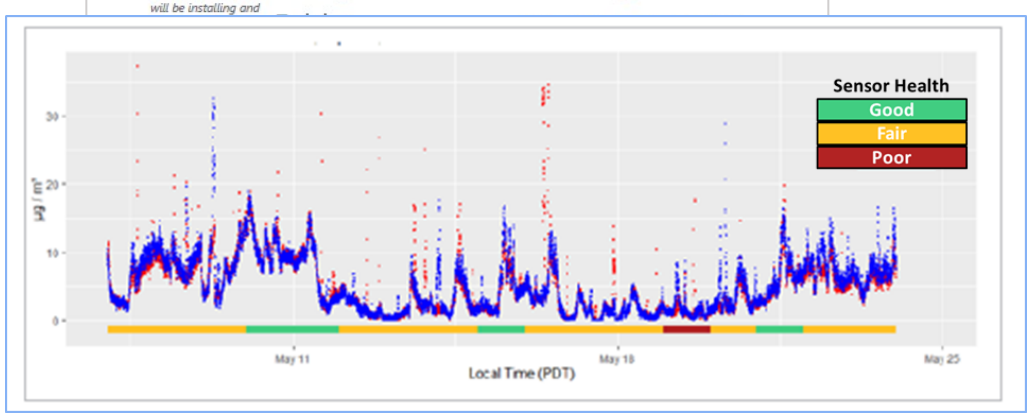
Figure 3-1. *Project planning is a process that may need to be repeated to adjust for realities such as budget limitations.*

Educational Toolkit: Sensor Selection

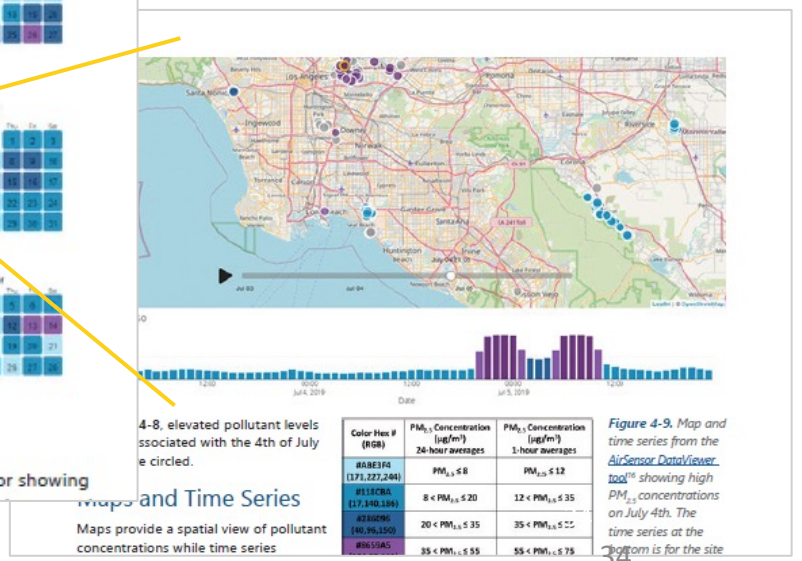




Educational Toolkit: Sensor Deployment



- Practical advice for siting, installing, and maintaining sensors
- Introduction to different plot types, assessing accuracy, and useful quality control (QC) metrics/algorithms
- Ways to monitor the "State-of-Health" of deployed sensors
- Description of tools and resources available for data analysis
- Step-by-step example analysis of an air quality event (using the AirSensor DataViewer)



Educational Toolkit: Taking Action

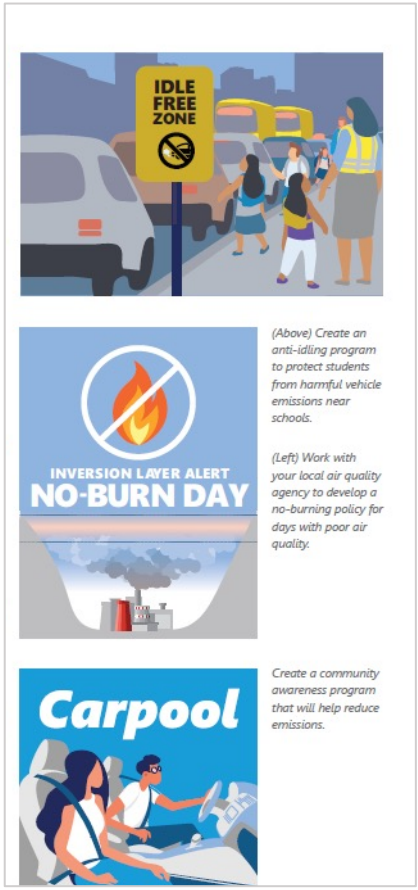
- Ideas for and examples of “local action”
- Advice to help determine whether additional data should be collected
- Strategies for communicating with local government agencies and/or the broader community (e.g., sharing results)

a flag that corresponds to the AQI: green, yellow, orange, red, and purple. EPA offers guidance on school flag programs.[15]

Other Mitigation Strategies

At a higher level of funding and city

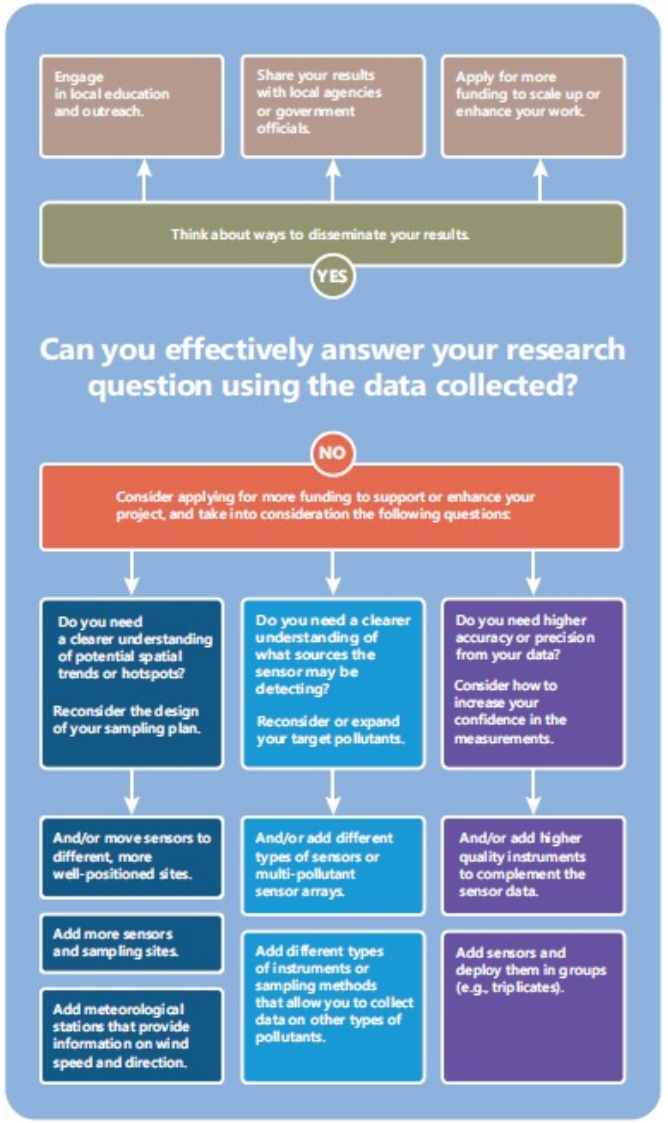
Flow chart to help those leading a project consider potential “next steps”



(Above) Create an anti-idling program to protect students from harmful vehicle emissions near schools.

(Left) Work with your local air quality agency to develop a no-burning policy for days with poor air quality.

Create a community awareness program that will help reduce emissions.



Questions?

https://www.baaqmd.gov/community-health/community-health-protection-program

http://www.aqmd.gov/nav/about/initiatives/environmental-justice/ab617-134

https://www.aqmd.gov/aq-spec/special-projects/star-grant

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